FIG. 1

DNA SEQUENCE FOR HUMAN
PREPROPARATHYROID HORMONE

```
        10                  30                  50
ATGATHCCNGCNAARGAYATGGCNAARGTNATGATHGTNATGYTNGCNATHTGYTTYYTN

        70                  90                  110
ACNAARWSNGAYGGNAARWSNGTNAARAARMGNWSNGTNWSNGARATHCARYTNATGCAY

        130                 150                 170
AAYYTNGGNAARCAYYTNAAYWSNATGGARMGNGTNGARTGGYTNMGNAARAARYTNCAR

        190                 210                 230
GAYGTNCAYAAYTTYGTNGCNYTNGGNGCNCCNYTNGCNCCNMGNGAYGCNGGNWSNCAR

        250                 270                 290
MGNCCNMGNAARAARGARGAYAAYGTNYTNGTNGARWSNCAYGARAARWSNYTNGGNGAR

        310                 330
GCNGAYAARGCNGAYGTNAAYGTNYTNACNAARGCNAARWSNCARTRR
```

M = A OR C
R = A OR G
W = A OR T
S = C OR G
Y = C OR T
H = A OR C OR T
N = A OR G OR C OR T

FIG. 2

DNA SEQUENCE FOR HUMAN
PREPROPARATHYROID HORMONE IN PLASMID pSSHPTH-10

```
        10                  30                  50
TATGATGATACCTGCAAAAGACATGGCTAAAGTTATGATTGTCATGTTGGCAATTTGTTT

        70                  90                  110
TCTTACAAAATCGGATGGGAAATCTGTTAAGAAGAGATCGTGGAGTGAAATACAGCTTAT

        130                 150                 170
GCATAACCTGGGAAAACATCTGAACTCGATGGAGAGAGTAGAATGGCTGCGTAAGAAGCT

        190                 210                 230
GCAGGATGTGCACAATTTTGTTGCCCTTGGAGCTCCTCTAGCTCCCAGAGATGCTGGTTC

        250                 270                 290
CCAGAGGCCCCGAAAAAAGGAAGACAATGTCTTGGTTGAGAGCCATGAAAAAAGTCTTGGA

        310                 330
GAGGCAGACAAAGCTGATGTGAATGTATTAACTAAAGCTAAATCCCAGTGA
```

FIG.3

PORTION OF DNA SEQUENCE OF THE PLASMID FOR INSERTION INTO E. COLI, CODING FOR HUMAN PREPROPARATHYROID HORMONE WITH FLANKING SEQUENCES.

```
        10                  30                  50
TATGATGATHCCNGCNAARGAYATGGCNAARGTNATGATHGTNATGYTNGCNATHTGYTT

        70                  90                  110
YYTNACNAARWSNGAYGGNAARWSNGTNAARAARMGNWSNGTNWSNGARATHCARYTNAT

        130                 150                 170
GCAYAAYYTNGGNAARCAYYTNAAYWSNATGGARMGNGTNGARTGGYTNMGNAARAARYT

        190                 210                 230
NCARGAYGTNCAYAAYTTYGTNGCNYTNGGNGCNCCNYTNGCNCCNMGNGAYGCNGGNWS

        250                 270                 290
NCARMGNCCNMGNAARAARGARGAYAAYGTNYTNGTNGARWSNCAYGARAARWSNYTNGG

        310                 330                 350
NGARGCNGAYAARGCNGAYGTNAAYGTNYTNACNAARGCNAARWSNCARTRRAAATGAAA

        370                 390                 410
ACAGATATTGTCAGAGTTCTGCTCTAGACAGTGTAGGGCAACAATACATGCTGCTAATTC

        430
AAAGCTCTATTA
```

M = A OR C
R = A OR G
W = A OR T
S = C OR T
Y = C OR T
H = A OR C OR T
N = A OR G OR C OR T

FIG. 4

DNA SEQUENCE FOR HUMAN PREPROPARATHYROID HORMONE IN PLASMID pSSHPTH-10 WITH FLANKING SEQUENCES

```
        10                  30                  50
TATGATGATACCTGCAAAAGACATGGCTAAAGTTATGATTGTCATGTTGGCAATTTGTTT

        70                  90                  110
TCTTACAAAATCGGATGGGAAATCTGTTAAGAAGAGATCTGTGAGTGAAATACAGCTTAT

        130                 150                 170
GCATAACCTGGGAAAACATCTGAACTCGATGGAGAGAGTAGAATGGCTGCGTAAGAAGCT

        190                 210                 230
GCAGGATGTGCACAATTTTGTTGCCCTTGGAGCTCCTCTAGCTCCCAGAGATGCTGGTTC

        250                 270                 290
CCAGAGGCCCCGAAAAAAGGAAGACAATGTCTTGGTTGAGAGCCATGAAAAAAGTCTTGG

        310                 330                 350
AGAGGCAGACAAAGCTGATGTGAATGTATTAACTAAAGCTAAATCCCAGTGAAAATGAAA

        370                 390                 410
ACAGATATTGTCAGAGTTCTGCTCTAGACAGTGTAGGGCAACAATACATGCTGCTAATTC

        430
AAAGCTCTATTA
```

FIG. 5

DNA SEQUENCE CODING FOR PREPROPARATHYROID HORMONE IN pSSHPTH-10 WITH FLANKING SEQUENCES, SHOWING THE CORRESPONDING AMINO ACID SEQUENCE OF PREPROPARATHYROID HORMONE

```
        10                  30                  50
TATGATGATACCTGCAAAAGACATGGCTAAAGTTATGATTGTCATGTTGGCAATTTGTTT
  MetIleProAlaLysAspMetAlaLysValMetIleValMetLeuAlaIleCysPh

        70                  90                  110
TCTTACAAAATCGGATGGGAAATCTGTTAAGAAGAGATCTGTGAGTGAAATACAGCTTAT
eLeuThrLysSerAspGlyLysSerValLysLysArgSerValSerGluIleGlnLeuMe

        130                 150                 170
GCATAACCTGGGAAAACATCTGAACTCGATGGAGAGAGTAGAATGGCTGCGTAAGAAGCT
tHisAsnLeuGlyLysHisLeuAsnSerMetGluArgValGluTrpLeuArgLysLysLe

        190                 210                 230
GCAGGATGTGCACAATTTTGTTGCCCTTGGAGCTCCTCTAGCTCCCAGAGATGCTGGTTC
uGlnAspValHisAsnPheValAlaLeuGlyAlaProLeuAlaProArgAspAlaGlySe

        250                 270                 290
CCAGAGGCCCCGAAAAAAGGAAGACAATGTCTTGGTTGAGAGCCATGAAAAAAGTCTTGG
rGlnArgProArgLysLysGluAspAsnValLeuValGluSerHisGluLysSerLeuGl

        310                 330                 350
AGAGGCAGACAAAGCTGATGTGAATGTATTAACTAAAGCTAAATCCCAGTGAAAATGAAA
yGluAlaAspLysAlaAspValAsnValLeuThrLysAlaLysSerGlnEnd

        370                 390                 410
ACAGATATTGTCAGAGTTCTGCTCTAGACAGTGTAGGGCAACAATACATGCTGCTAATTC

        430
AAAGCTCTATTA
```

FIG. 6

NUCLEOTIDE SEQUENCE OF THE MF 1-HPTH FISION GENE FROM pS LX5-HPTH1. NUCLEOTIDE NOS. 1-173 MAKEUP THE MH 1 PROMOTER REGION AND 5' NONCODING SEQUENCE. 174-440 IS THE MF 1 N-TERMINAL CODING SEQUENCE. 441-695 IS THE HPTH SEQUENCE OBTAINED FROM pSSHPTH-10. 696-726 IS AN HPTH 3' NONCODING SEQUENCE FROM pSSHPTH-10. 727-732 IS FROM pUC19. 733-874 IS MF 1 3' NONCODING SEQUENCE AND TRANSCRIPTIONAL TERMINATION SIGNAL.

```
        10                  30                  50
AGTGCAAGAAAACCAAAAAGCAACAACAGGTTTTGGATAAGTACATATATAAGAGGGCCT
        70                  90                  110
TTTGTTCCCATCAAAAATGTTACTGTTCTTACGATTCATTTACGATTCAAGAATAGTTCA
        130                 150                 170
AACAAGAAGATTACAAACTATCAATTTCATACACAATATAAACGACCAAAAGAATGAGAT
        190                 210                 230
TTCCTTCAATTTTTACTGCAGTTTTATTCGCAGCATCCTCCGCATTAGCTGCTCCAGTCA
        250                 270                 290
ACACTACAACAGAAGATGAAACGGCACAAATTCCGGCTGAAGCTGTCATCGGTTACTCAG
        310                 330                 350
ATTTAGAAGGGGATTTCGATGTTGCTGTTTTGCCATTTTCCAACAGCACAAATAACGGGT
        370                 390                 410
TATTGTTTATAAATACTACTATTGCCAGCATTGCTGCTAAAGAAGAAGGGGTATCTTTGG
        430                 450                 470
ATAAAAGAGAGGCTGAAGCTTCTGTGAGTGAAATACAGCTTATGCATAACCTGGGAAAAC
        490                 410                 530
ATCTGAACTCGATGGAGAGAGTAGAATGGCTGCGTAAGAAGCTGCAGGATGTGCACAATT
        550                 570                 590
TTGTTGCCCTTGGAGCTCCTCTAGCTCCCAGAGATGCTGGTTCCCAGAGGCCCCGAAAAA
        610                 630                 650
AGGAAGACAATGTCTTGGTTGAGAGCCATGAAAAAAGTCTTGGAGAGGCAGACAAAGCTG
        670                 690                 710
ATGTGAATGTATTAACTAAAGCTAAATCCCAGTGAAAATGAAAACAGATATTGTCAGAGT
        730                 750                 770
TCTGCTCTAGAGTCGACTTTGTTCCCACTGTACTTTTAGCTCGTACAAAATACAATATAC
        790                 810                 830
TTTTCATTTCTCCGTAAACAACCTGTTTTCCCATGTAATATCCTTTTCTATTTTTCGTTT
        850                 870
CGTTACCAACTTTACACATACTTTATATAGCTAT
```

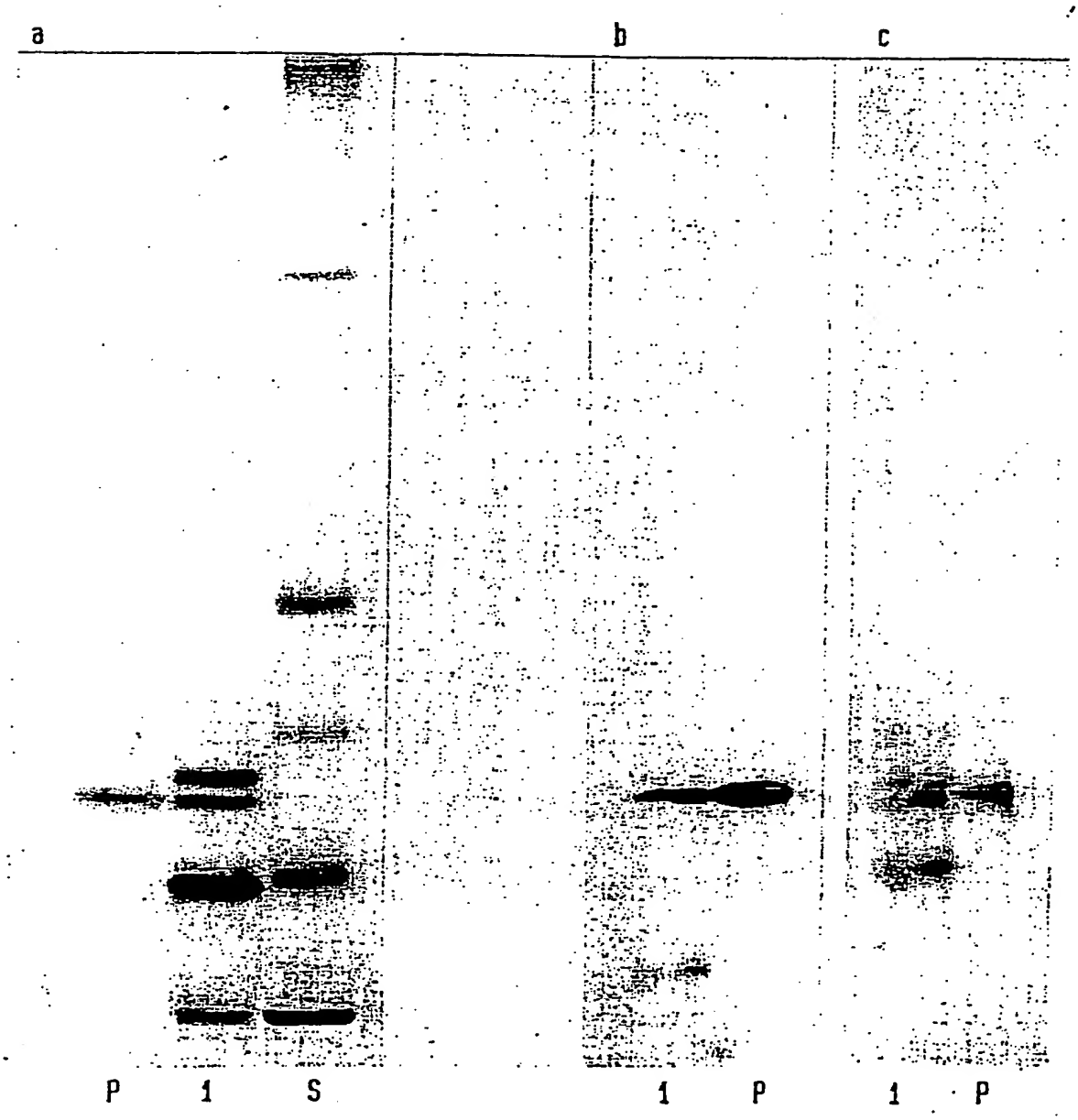
FIG. 7

PARTIAL DNA SEQUENCE FOR THE PLASMID FOR INSERTION INTO TEST IN WHICH: NUCLEOTIDE NOS. 1-173 MAKEUP THE MF 1 PROMOTER REGION AND 5' NONCODING SEQUENCE. 174-440 IS THE MF 1 N-TERMINAL CODING SEQUENCE. 441-695 IS AN HPTH SEQUENCE. 696-726 IS AN HPTH 3' NONCODING SEQUENCE FROM pSSHPTH-10. 727-732 IF FROM pUC19. 733-874 IS MF 1 3' NONCODING SEQUENCE AND TRANSCRIPTIONAL TERMINATION SIGNAL.

```
        10                                  30
AGTGCAAGAAAACCAAAAAGCAACAACAGGTTTTGGATAAGTACATATATAAGAGGGCCT
        70                  90              110
TTTGTTCCCATCAAAAATGTTACTGTTCTTACGATTCATTTACGATTCAAGAATAGTTCA
       130                 150              170
AACAAGAAGATTACAAACTATCAATTTCATACACAATATAAACGACCAAAAGAATGAGAT
       190                 210              230
TTCCTTCAATTTTTACTGCAGTTTTATTCGCAGCATCCTCCGCATTAGCTGCTCCAGTCA
       250                 270              290
ACACTACAACAGAAGATGAAACGGCACAAATTCCGGCTGAAGCTGTCATCGGTTACTCAG
       310                 330              350
ATTTAGAAGGGGATTTCGATGTTGCTGTTTTGCCATTTTCCAACAGCACAAATAACGGGT
       370                 390              410
TATTGTTTATAAATACTACTATTGCCAGCATTGCTGCTAAAGAAGAAGGGGTATCTTTGG
       430                 450              470
ATAAAAGAGAGGCTGAAGCTWSNGTNWSNGARATHCARYTNATGCAYAAYYTNGGNAARC
       490                 510              530
AYYTNAAYWSNATGGARMGNGTNGARTGGYTNMGNAARAARYTNCARGAYGTNCAYAAYT
       550                 570              590
TYGTNGCNYTNGGNGCNCCNYTNGCNCCNMGNGAYGCNGGNWSNCARMGNCCNMGNAARA
       610                 630              650
ARGARGAYAAYGTNYTNGTNGARWSNCAYGARAARWSNYTNGGNGARGCNGAYAARGCNG
       670                 690              710
AYGTNAAYGTNYTNACNAARGCNAARWSNCARTRRAAATGAAAACAGATATTGTCAGAGT
       730                 750              770
TCTGCTCTAGAGTCGACTTTGTTCCCACTGTACTTTTAGCTCGTACAAAATACAATATAC
       790                 810              830
TTTTCATTTCTCCGTAAACAACCTGTTTTCCCATGTAATATCCTTTTCTATTTTTCGTTT
       850                 870
CGTTACCAACTTTACACATACTTTATATAGCTAT, WHEREIN
```

M = A OR C
R = A OR G
W = A OR T
S = C OR G
Y = C OR T
H = A OR C OR T
N = A OR G OR C OR T

FIG. 8



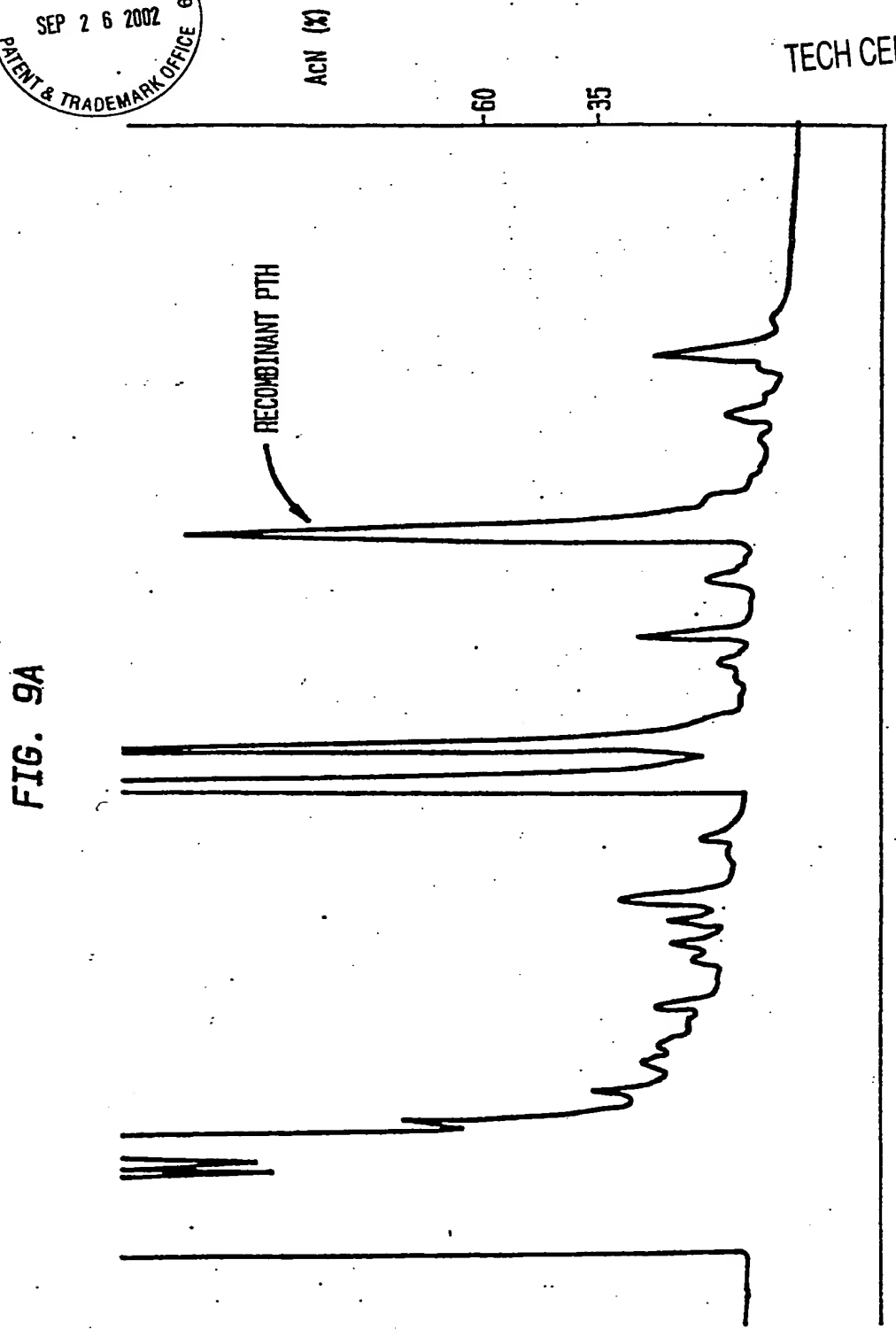


FIG. 9A

FIG. 9B

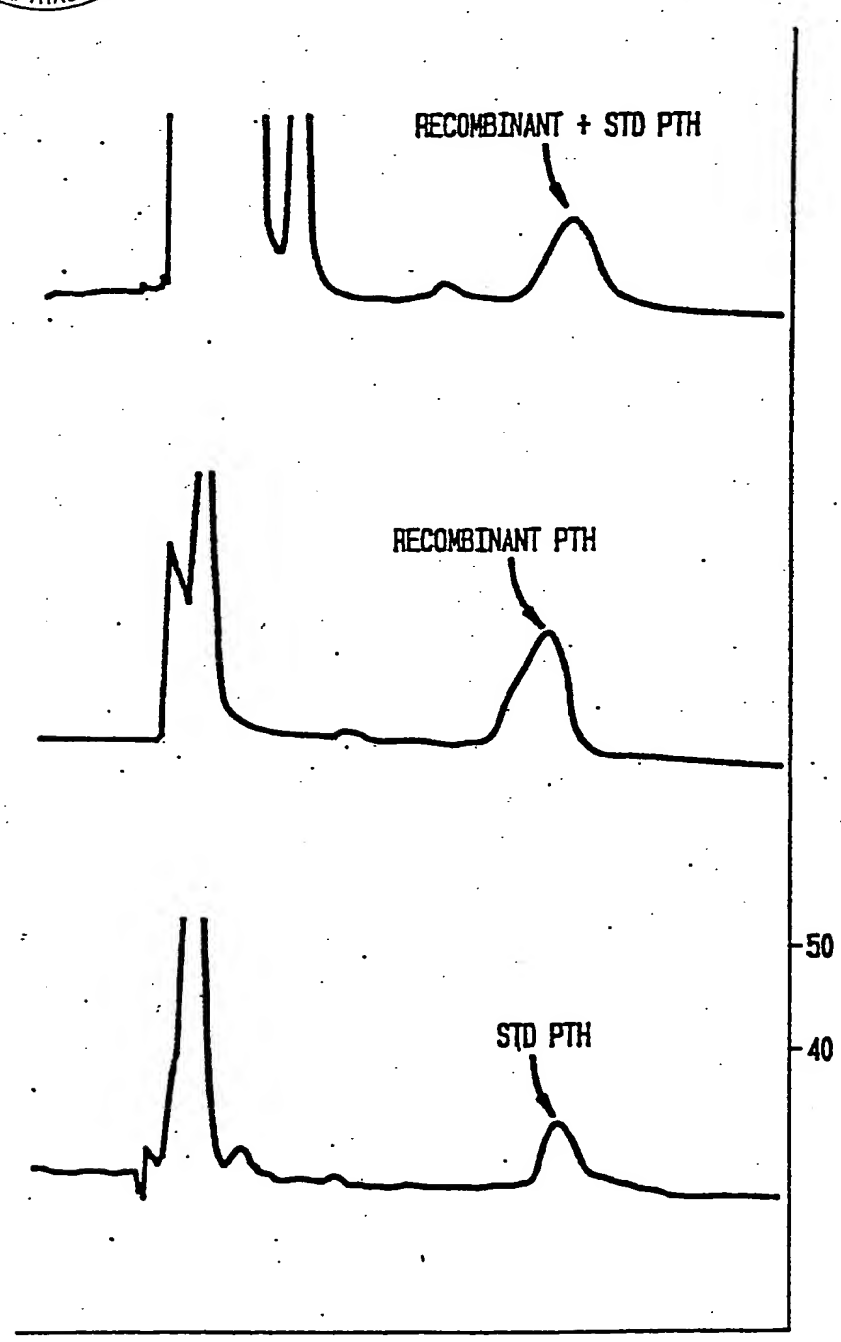


FIG. 10B

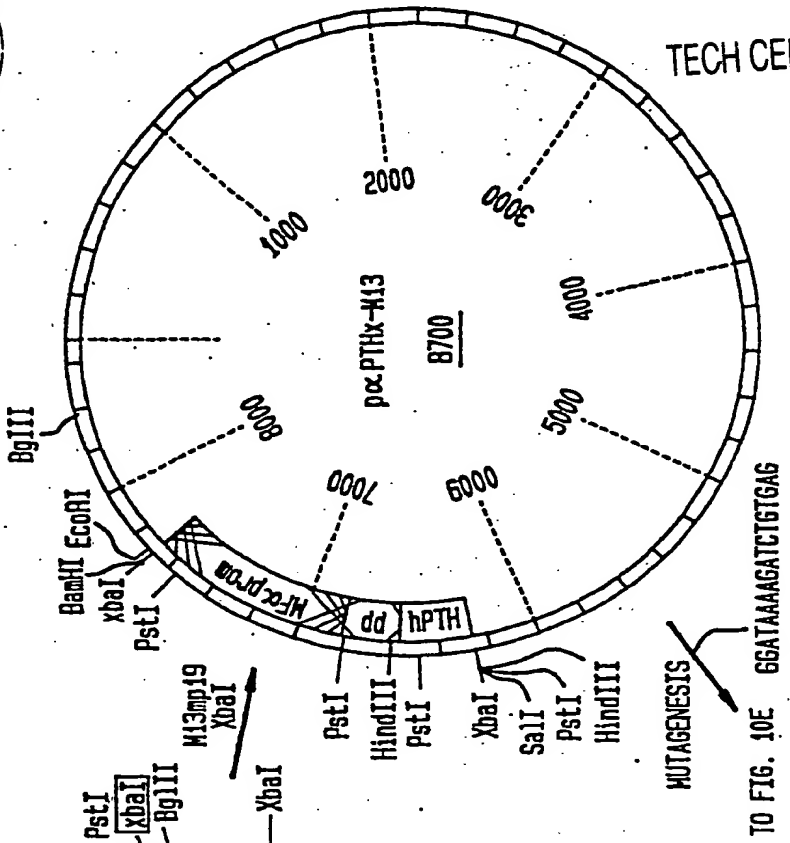


FIG. 10A

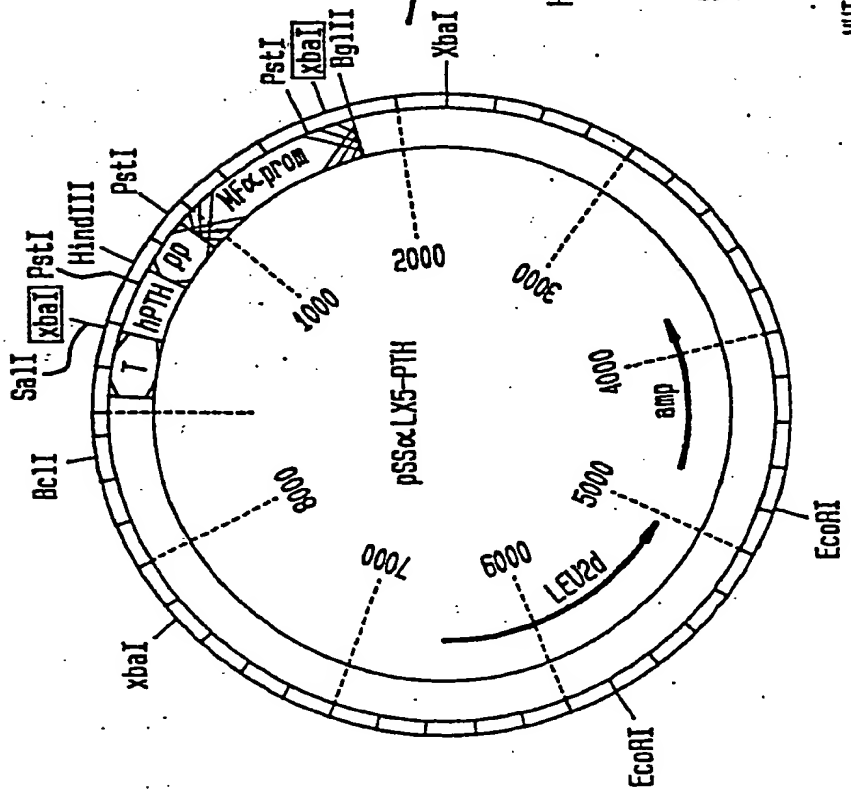


FIG. 10D

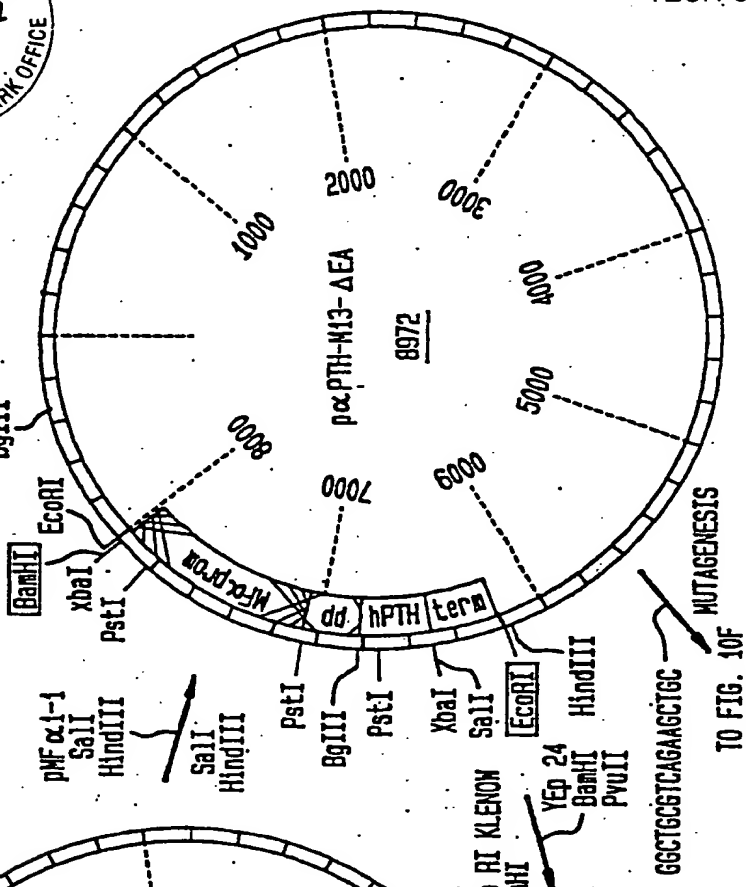


FIG. 10C

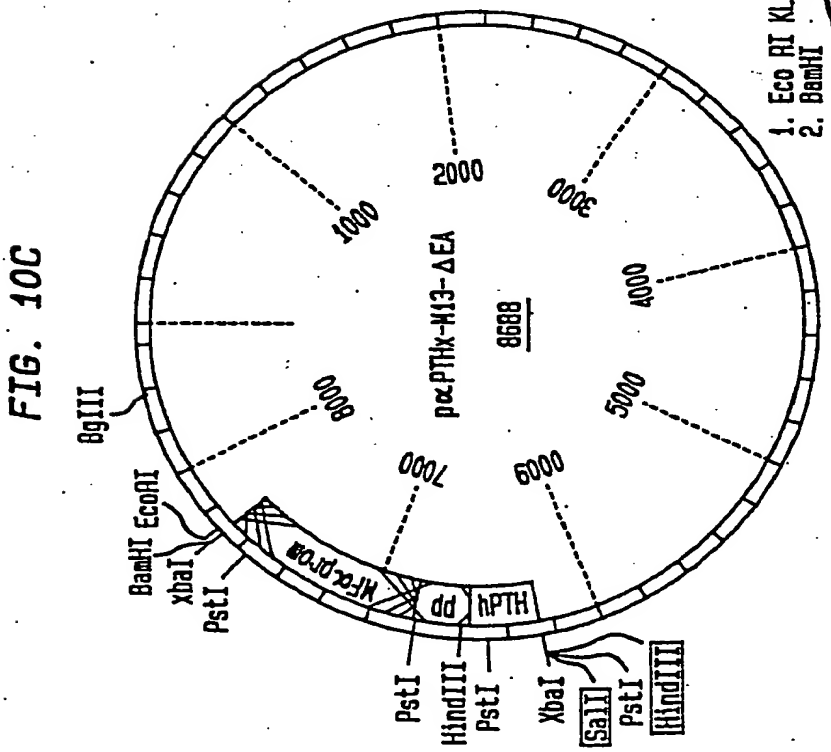


FIG. 10F

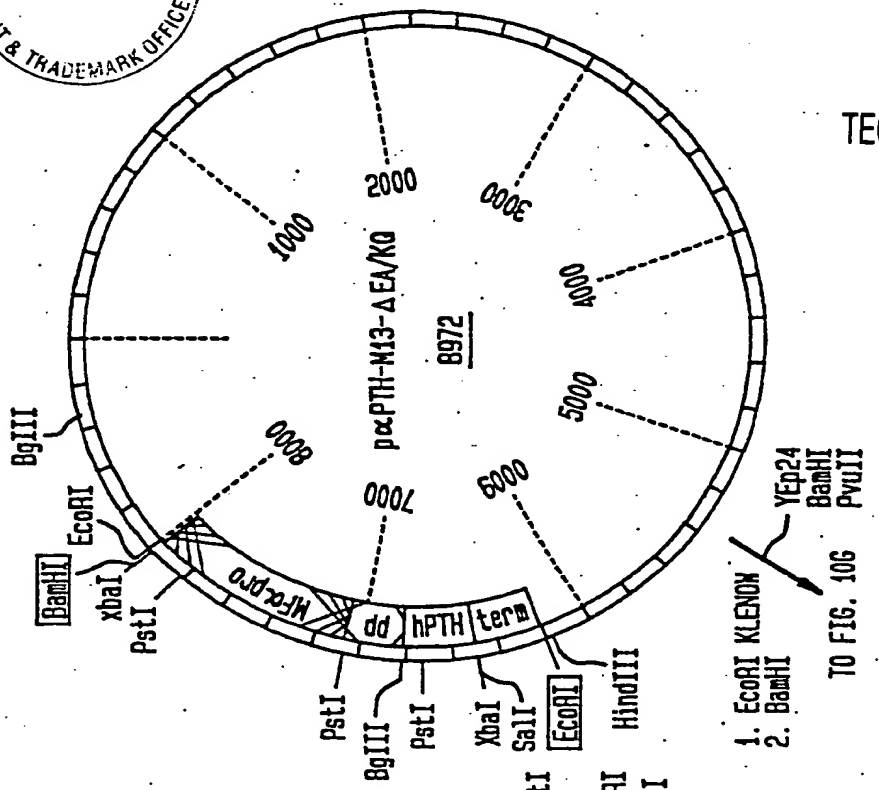
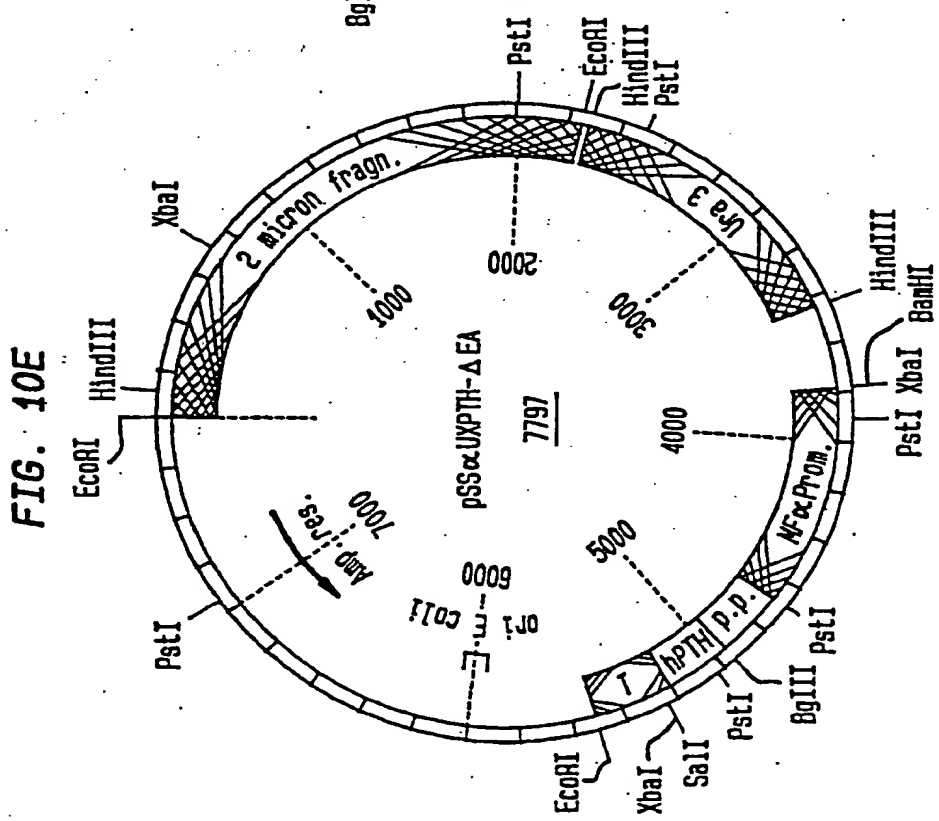


FIG. 10E



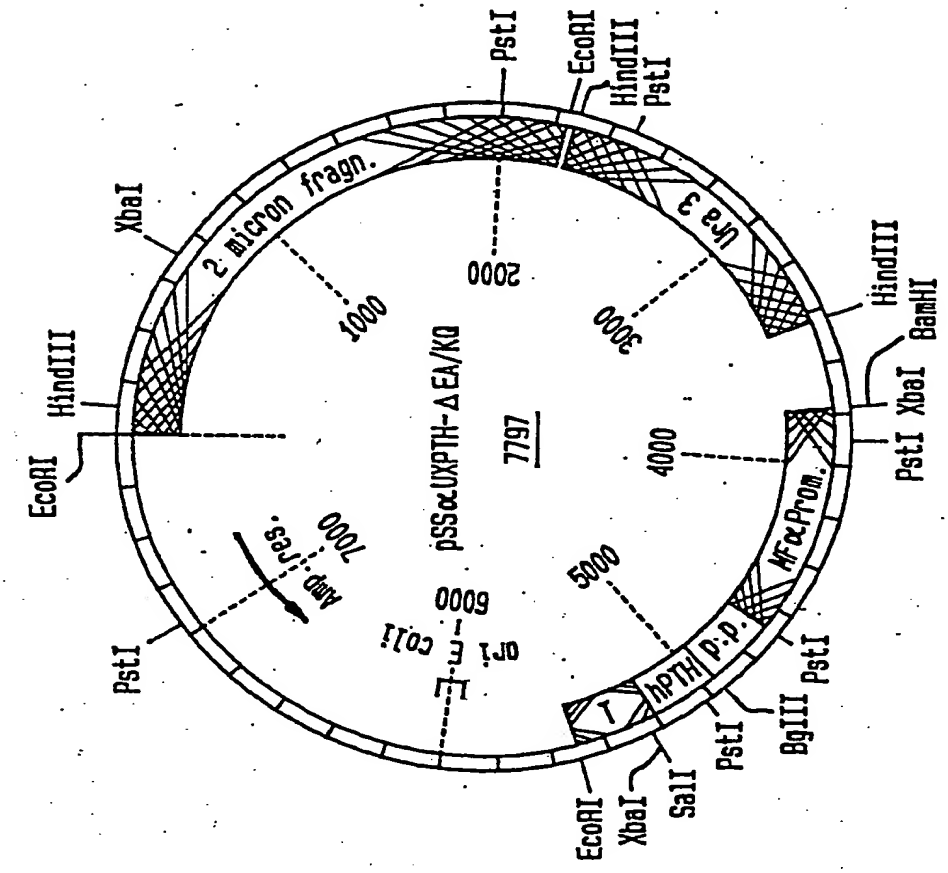


FIG. 10G

FIG. 11

IN vitro MUTAGENESIS OF hPTH

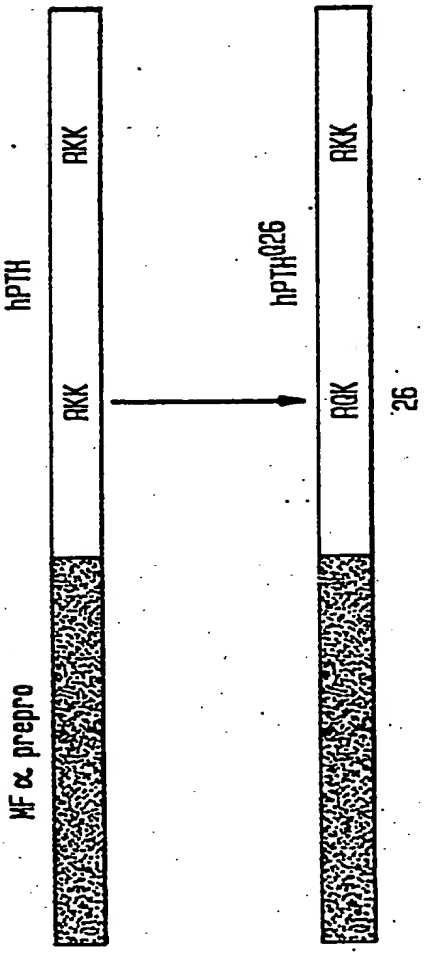
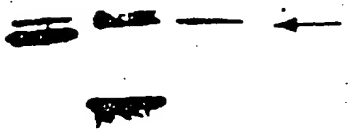


FIG. 12



1 2 M

FIG. 13A

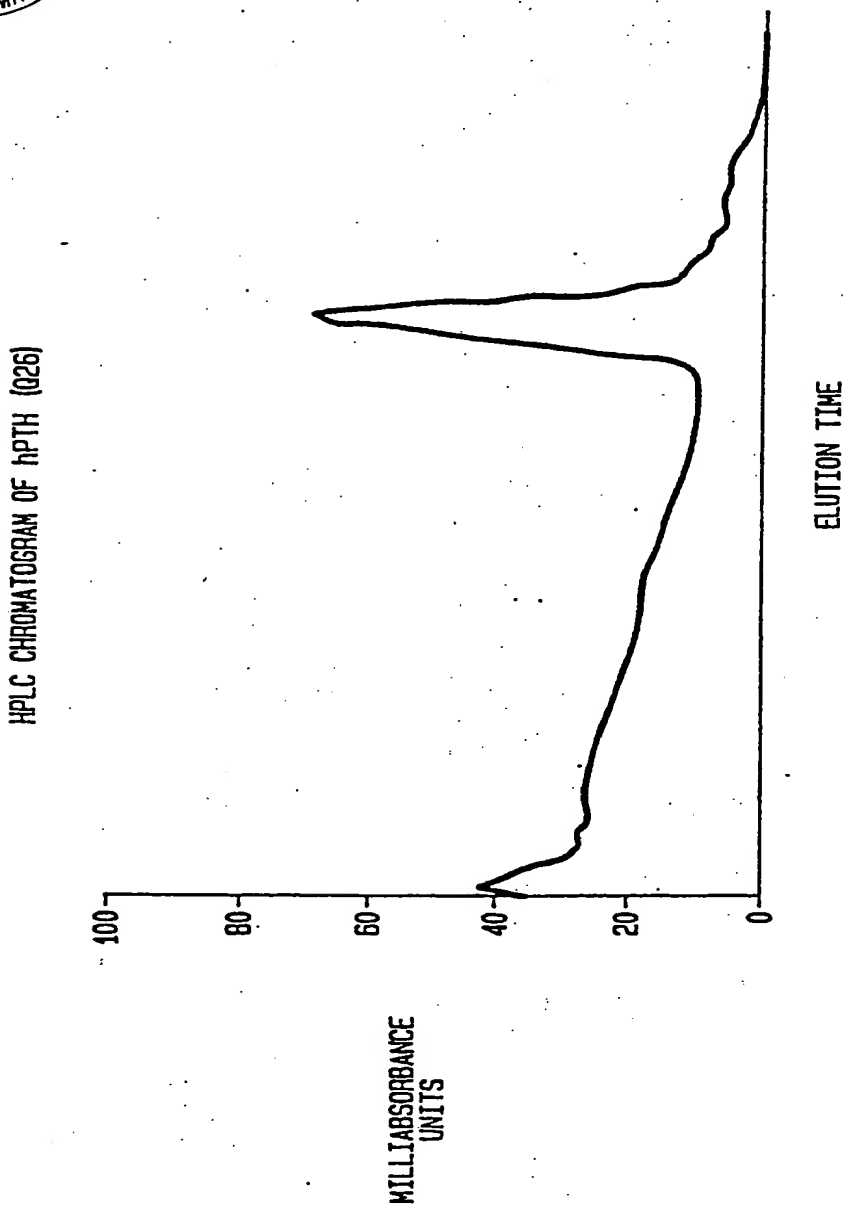
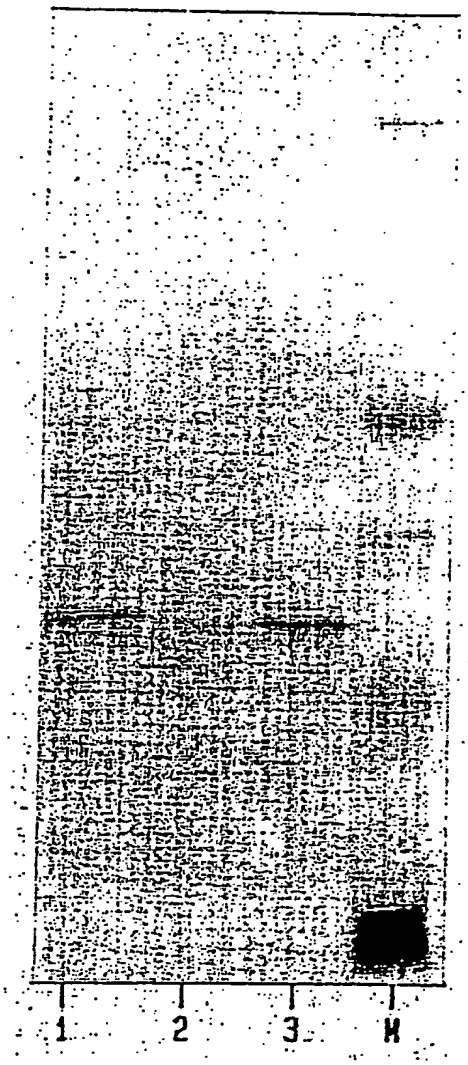


FIG. 13B



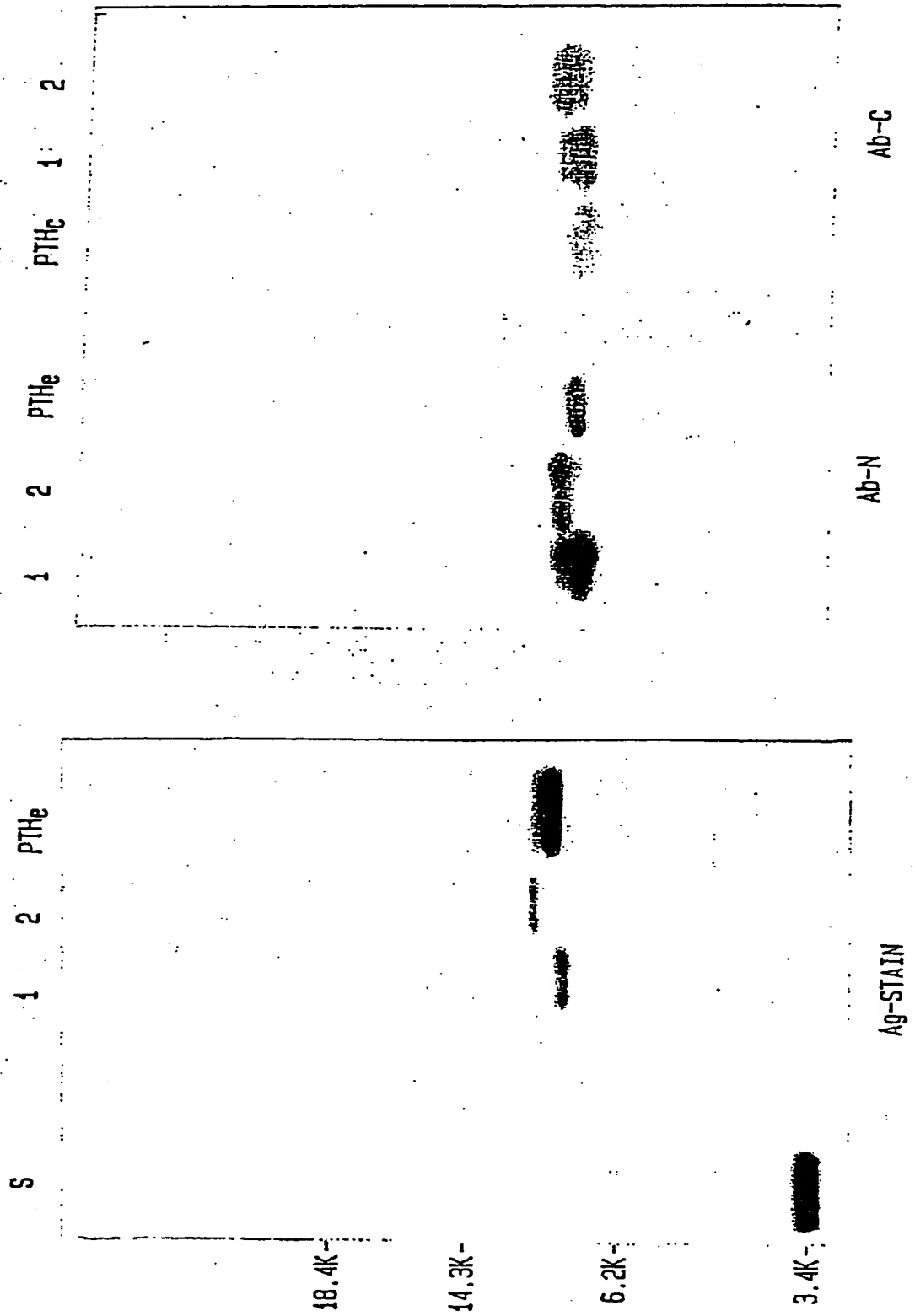


FIG. 14

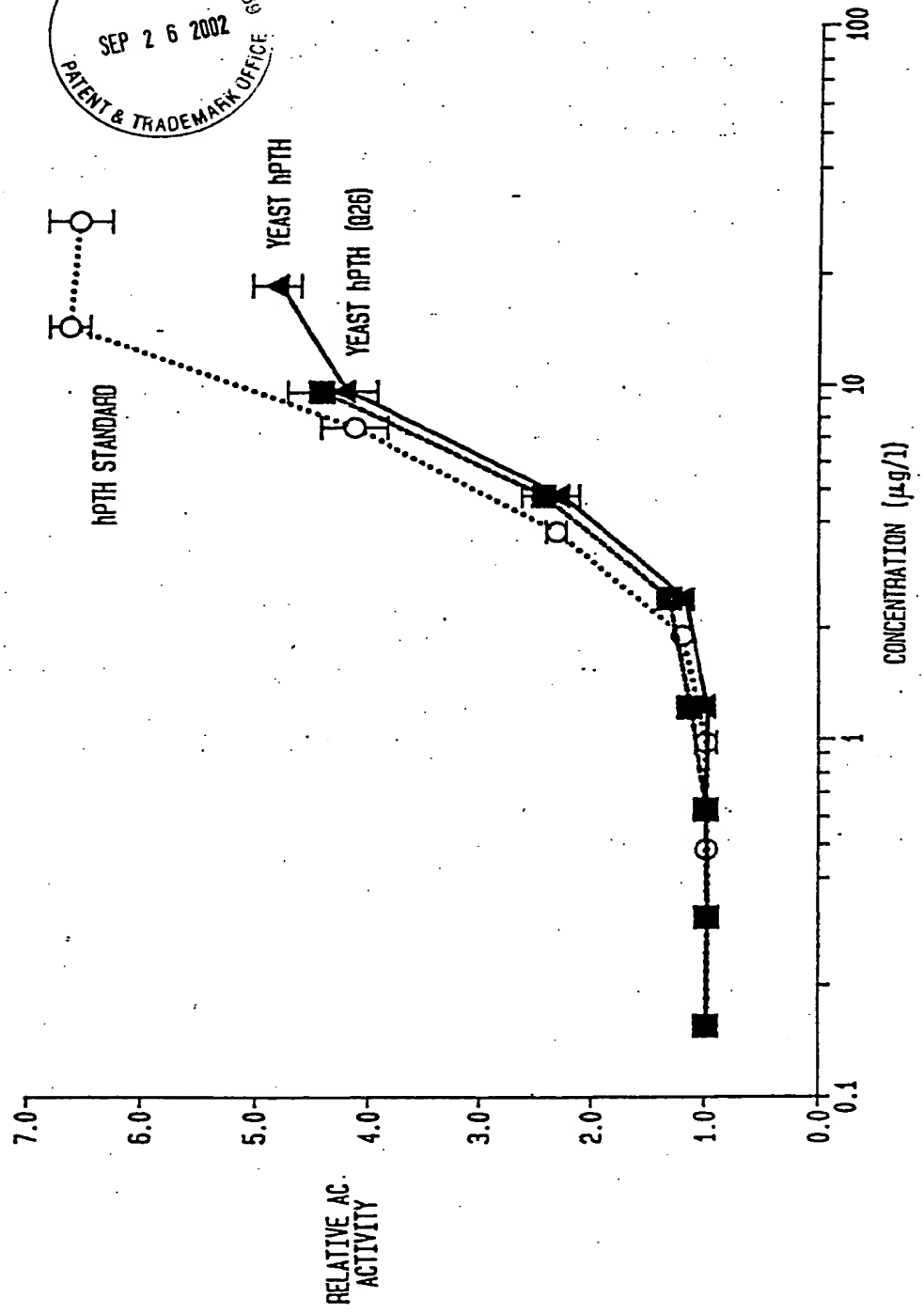


FIG. 15